



## Selective Release Apparatus for Fluids

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This application is based upon, and claims priority from, United States Provisional Patent Application 60/175,841 filed Jan. 13, 2000 with the same title, and this application incorporates that provisional application (60/175,841) by reference.

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### BACKGROUND

#### Field of the Invention

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This invention relates generally to the field of the release of compounds into air or water, and more particularly to a selective release apparatus that releases a compound upon stimulus from a gas or other compound.

#### Description of related art

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In the field of odor removal or air purification, it is highly desirable to be able to release special agents or compounds into air or water or other fluid to either remove an odor, convert a compound, provide a fresh or perfume scent, or other purpose. Since such agents or compounds are expensive, and most devices designed to release them contain only a finite reservoir of the agent, it would be very desirable to be able to sense the

presence of a specific contaminant or odor causing compound or set of compounds, and then release enough of the agent to either remove the odor, mask it, or convert it to a non-contaminant.

Prior art methods have employed various chemical or electronic sensors to determine when a contaminant is present. These methods however, usually require electrical power, electronics, processors, etc., and can be bulky and expensive. Also, they generally require a mechanical release mechanism separate from the detection mechanism.

A particular location where an agent release product is desirable is in a bathroom or lavatory area where sometimes undesirable smells or odors can be produced. It is very desirable to sense these odors when their concentration is fairly low, and release a fragrance agent into the air to either mask them or convert them to a non-odorous compounds.

What is badly needed is a very small, cheap apparatus that could be attached to a toilet, or mounted on a wall in an area likely to become contaminated with either odor causing or otherwise objectionable compounds. Such a device should detect such target compounds in a fluid like air or water and selectively release agent compounds to either combat the odor or convert the contaminants to other, less objectionable, compounds.

## SUMMARY OF THE INVENTION

The present invention relates to a selective response, controlled release mechanism for fluids such as air or water, where a gas or compound sensitive polymer expands or contracts in the presence of the undesirable contaminant, and this mechanical change in the shape or position of the polymer itself causes a release valve to open or close on a reservoir of agent that is then selectively released into the surrounding air, water, or other fluid.

The active fluid agent is contained in a capsule, a sack, or is contained in a droplet by its surface tension. The capsule, sack, or droplet is coated with a compound selective polymer. In response to its target compound, the polymer changes shape. The capsule, sack, or droplet is affected by the change in shape in a manner that results in a controlled release of the active compound into the surrounding fluid. For example, in one embodiment of the present invention, the active agent container is squeezed by expansion of the polymer upon presence of a target compound causing the active agent to be dispensed through an exit orifice.

Polymers such as poly-styrene, poly-alpha-methyl-styrene, and many others can be used in the present invention. The important characteristic of the polymer is that it change size when exposed to a target compound. Various polymer sensors are

described in United States Patents 5,959,191 and 5,571,401 which are hereby incorporated by reference. These sensors use the polymer's mechanical dilation to change resistance. The present invention uses the polymer's dilation mechanically to directly  
5 release active agents.

#### BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of this invention, reference should now be made to the embodiments illustrated in greater detail in the accompanying drawings and described below by way of  
10 examples of the invention.

FIGURE 1 shows an embodiment of the present invention which uses a capsule with a release orifice.

FIGURE 2 shows an embodiment of the present invention in a frame with multiple polymer sensors.

15 FIGURE 3 shows an embodiment of the present invention that uses a an active agent encased in a polymer.

It should be understood, of course, that the invention is not necessarily limited to the particular embodiments illustrated herein.

## DESCRIPTION OF PREFERRED EMBODIMENTS

Turning to Figure 1, a cutout view of an embodiment of the present invention can be seen that has a container 1 for active agent encased in a polymer shell 2. Also an exit orifice 3 can be seen. When the selective polymer 2 senses a target compound, it can contract around the active agent 1 increasing pressure in the agent fluid and causing it to exit through the exit orifice 3.

Figure 2 shows a different embodiment of the present invention. In this embodiment, a solid frame 6 surrounds a sack or capsule 4 containing an active agent compound. An exit orifice 3 penetrates into the sack or capsule 4. Strips or other constructions of compound sensitive polymer 5 surround the sack or capsule 4 and connect to the frame 6 or simply abut the frame 6. Each strip or piece of polymer 5 can be sensitive to a different target compound. When any particular target compound is present, the polymer sensitive to it contracts or otherwise changes shape, pressing on the sack or capsule 4 of active agent causing it to be pressed out of the exit orifice 3 into the surrounding fluid (usually the air).

Figure 3 shows an embodiment of the present invention that is a circular or oval capsule which has an inner compartment 7 surrounded by a shell of protective material 10 such as the material used to make medication capsules. Outside the protective shell 10 is a layer of compound sensitive polymer 8 which can contract in the presence of a target compound. When the concentration of the target compound (such as an odor) reaches a predetermined threshold, the pressure caused by the contraction of the polymer either ruptures the shell 10 or causes the active agent to exit an orifice or weak point in the shell 9. While the presence of such a weak point is optional, it is useful in that it can be adjusted to change the rupture or concentration threshold.

It is to be understood that the above-described arrangements are merely illustrative of the application of the principles of the invention, and that other arrangements may be devised by those skilled in the art without departing from the spirit and scope of the invention.